Specification

Title of the invention Lightweight engine

Technical field

This invention relates to the technology of cars, construction machineries, marine vessels, and electrical generators, which achieves great lightening the engine and the purification of the exhaust gas at the same time.

Background art

A pressurizing type engine using the turbo-charger having the intercooler with the low condensation was used for the fighter aircraft in 1940. Thereafter, it was applied for the motor racing such as F1. However, there are no technologies using the turbo-charger for the purpose of lightening the engine up to now. In the past, the principal object of the turbo-charger has been the improvement of the output power, and the purification of the exhaust gas.

There ware few ideas that try to use the exhaust gas in the prior art. There are only ideas such as the actuation of the turbo-charger by the exhaust gas, or the recirculation of the exhaust gas controlling burning temperature to be lower in the liner, etc.

In the prior art, temperature of the exhaust gas was lowered to be appropriate for the chemical reaction using three-way catalysts. Supplying the output, the fuel, and air was set to be able to produce purification utmost by the catalyst. Therefore, a mixture ratio of the fuel of the engine could not be set most appropriate theoretically.

In addition, the environmental standards and the fuel efficiency standards of cars are made strict worldwide, and the technology that saves weight of engine and purifies the exhaust gas are still incomplete.

Problems to be resolved by the invention
(Harmony with environmental technology)

The present invention is aimed at lightening the engine and the purification of the exhaust gas by effectively using the exhaust gas of the high temperature and the high pressure, and contributes to the environmental measure and the reduction of the and fuel efficiency.
The present invention achieves the environmental protection technologies engine for cars using hydrocarbons or alcohols as fuels.

Means of solving the problems

To drive the gasoline engine, air is compressed; fuel is injected, and ignited with an electric plug. To drive the diesel engine, inspired air is compressed to the ignition temperature; fuel is injected, self-ignited and exploded. Then explosion power is used as motive energy. Moreover, indirect injection type diesel engine injected mixture gas also use the explosion power. Pressure of air or mixture fuel gas injected into chambers is almost normal atmospheric pressure. In this case, length of cylinder liner needs to be the same length of the piston (from the bottom dead center to the upper dead center) in order to achieve the final compression ratio.
When air or mixture fuel gas is compressed beforehand, it does not need to compress in the cylinder liner, and height of the cylinder liner and engine block can be shorten and lighten.

When the prior compression is twice, the length of the compression room can be shortened in 1/2, and if it is four times, it is possible to be shortened to one-quarter. It makes length of a cylinder liner short, volume of an engine block decrease and weight of engine lighten.

When the total length of the cylinder liner shortens, the width of the movement of the piston is shortens. The connecting rod connected with the crankshaft can be also shortened and lightened.

If the total length of the connecting rod is shortened, turning radius and moving area of crankshaft can be decreased. Measures of enhancement for inertia force of piston or connecting rod. Size of oil pan can be shortened, height of engine block can be shortened, and weight can be lightened.

Oil consumption decreases to the extent that the moving part in the entire engine decreases. Stockpile of oil in the engine can be decreased, and the reduction of weight and the reduction in the maintenance cost are achieved.

In order to supply pressurized air and fuel mixture gas to liner stably, tank for temporal stock of pressured air is needed. Volume of tank is decided to keep the pressure which is set on completion of supplying the gas to liner. The tank needs to resist the 2-4 times the pressure loads of air and the thermal changes. The material impervious to vibration is used as the material of the tank. Further, in order to make the shapes having the stable inhalation of air or fuel mixture gas, light metals or plastics are used as the material.

The intake valve and the exhaust valve of the cylinder-head are driven by the hydraulic pump and the return spring with the solenoid method. The valve operation is controlled by the microcomputer. Therefore, the mechanism of the camshaft using the complex adjuster and the limiter from the low revolution area to the high revolution area assumed to be a difficult problem conventionally becomes useless. It contributes to lightening and the improvement of thermal efficiency.

The exhaust gas exhausted from the exhaust pipe is exhausted from the muffler after it drives the turbo-charger. The air pressure in the liner decreases to one air pressure almost instantaneously. Therefore, the valve operation (overlap of the exhaust bulb and the intake valve) for the improving of the inhalation performance such as the air that a present engine adopts being simplified, thermal efficiency is improved at the same time as the preventing of the blow-by of the air in the combustion chamber of the engine.

A small amount of hydrocarbon is injected into the exhaust gas to reduce peroxide, at the same time the pressure of the exhaust gas is increased, and the work rate of the turbo-charger is increased. Then the required air pressure is ensured.

Disclosure of the invention

According to the present invention, pressurized air or fuel mixture gas with 2 to 4 times or more makes the stroke distance of the piston short. Decreasing the momentum in the compression process improves the thermal efficiency of the engine.

Storing and controlling the air and the fuel mixture in the air tank under given conditions of the temperature and the pressure, intake into the liner of the engine can be keep constant. Additionally the pressurized air or fuel mixture gas 2 to 4 times achieved the reduction of the inhalation time and the high-speed rotation.

After firing in the combustion chamber of the engine, gas is exhausted from the liner with the high pressure and the high temperature compared with the inhaled gas. It is called exhaust gas hereafter. The combustion can be gone with the lean condition compared with the theoretical air fuel ratio, because the temperature at the combustion can be set with the expectation that the temperature of the liner will fall by vaporization of liquid fuel. The exhaust gas rotates turbochargers and is released into the atmosphere through the muffler. Therefore, the pressure of the liner decreased to be about 1 atmosphere immediately. So, blow-by of the inhalation gas is not concerned when the valve diagram is set, and the valve can be opened and shut with the best thermal efficiency.

Gas pressurized by the turbocharger is always measured with the pressure sensor. When the pressure is low, pressure is applied by the supercharger to adjust the pressure in the air tank. The temperature of gas is controlled by the temperature stabilizer. If the pressure is too high, it is released to the exhaust system through the release valve. The operation always provides gas or the fuel mixture gas having the temperature and the pressure originally intended to the liner.

The intake valve and the exhaust valve are controlled directly by using the oil pressure, so the conventional valve operation using the camshaft is discontinued and the direct operation using the

microcomputer. The electrical control allows the setting of the best valve timing from the low rotation to the high rotation.

The running the engine with the lean gas at high temperatures and pressures increase the oxide level in the exhaust gas. The appropriate doses of hydrocarbon (for example, LP-GAS) infused into the exhaust pipe activates the exhaust gas and reduces NOxs, sulfuric compounds, and carboxyl peroxides. In addition, few carbon monoxide gases are generated because the combustion is carried out under the high oxygen gas. And the secondary combustion in the exhaust pipe makes the oxidation of the carbon monoxide gas into the riskless CO_2 gas.

Brief description of the drawings

Fig. 1 shows the concept of the engine. The air tank of the gas for combustion is heated and cooled with the temperature stability unit. A gas is controlled to flow into the combustion chamber at a constant pressure and constant temperature. It shows that when the compression ration is increased, the compression movement step of the piston is decreased for the approaching design compression ratio of the engine. As a result, the connecting rod is shortened and the turning radius of the crankshaft is also shortened greatly. In addition, it doesn't need an extra stabilizer.

Fig. 2 is a basic schematic diagram showing that the exhaust gas generates the gas with the constant pressure, and that is stored in the air tank.

Fig. 3 shows a basic configuration of the turbo-charger. Such turbo-chargers placed in a line by two steps or more and pressurized air or fuel mixture gas is made.

Fig. 4 is a schematic diagram showing that the suction valve and the exhaust valve are controlled by the hydraulic operation with the microcomputer to operate precisely than the conventional connecting rod.

Fig. 5 is a schematic diagram of the air tank which stores pressurized air and fuel mixture gas.

Best mode for carrying out the invention

Fig. 1 is a schematic diagram of the engine. When air is pressurized highly, compression process is decreased. Then total length of the connecting rod (21) and turning radius of the crankshaft (22) is decreased, and the weight is decreased greatly. Additionally, the temperature and the pressure of the air tank (1) can be controlled by the microcomputer reading the numerical value of the sensor located in some areas. Therefore, the burning and the explosion can be controlled stably. And the provision against the exhaust gas, which is nitrogen peroxide gas, carbon monoxide gas, sulfured gas, and unburned fuels, becomes easier. Since the intake gas and the exhaust gas is

controlled separately by the motive energy of the oil hydraulics or the electromagnetic force from the microcomputers, operation of the valves can be optimized than ever before and the burning and the explosion can be controlled in line with theoretical figure.

Fig. 2 is a schematic diagram of the system of the reading numerical value of the sensor by the turbocharger (23) and the supercharger (28) and the storing the air and the mix fuel gas with the temperature and the pressure setting stably in the air tank. Additionally, the hydrocarbon gas such as oil gas etc. is filled in the exhaust pipe (24,25) so that the exhaust gas, which is nitrogen peroxide gas, carbon monoxide gas, sulfured gas, and unburned fuels, is purified and the efficiency of the turbocharger is increased.

Fig. 3 is a schematic diagram of the turbocharger.

Fig. 4 is a schematic diagram when the valve is driven with oil. Shown in the figure, the valves controlled separately by the hydraulic pressure or the motive energy of the electromagnetic force, therefore the delicate camshafts or the complex valve lifters for the acceptance both of the high-speed rotation and the low-speed rotation are not needed. Weight and cost can be decreased dramatically.

Fig. 5 is a schematic diagram of the air receiver. Pressure release valve (34) is provided since pressure becomes high too much.

Explanation of references

1. Air tank
2. Heater
3. Thermometry unit
4. Temperature controller
5. Cooler
6. Heat exchange
7. Oil
8. Temperature stabilization unit
9. Hydraulic pump for valve drive
10. Return spring
11. Hydraulic line
12. Return pipe for operating oil
13. Spark plug
14. Fuel injection pipe
15. Exhaust manifold
16. Exhaust valve

17. Fuel atomization device
18. Intake valve
19. Piston
20. Liner
21. Connecting rod
22. Crankshaft
23. Air turbine for increasing pressure
24. Gas injection pipe for exhaust gas purification
25. Gas atomization device for exhaust gas purification
26. Temperature pressure sensor
27. Oxygen and nitric oxide concentration sensor
28. Supercharger
29. Muffler
30. Tail pipe
31. Turbine
32. Hydraulic piston for valve drive
33. Pressure release valve of air tank
34. Air gateway of air tank
35. Hydraulic operated valve for valve driving
36. Microcomputer interconnect line for controlling hydraulic operated valve

Industrial applicability

Since air and mix fuel gas is inhaled to the liner at a constant temperature and a pressure all of the times, degree of freedom of the combustion chamber design is improved. In addition, in the engine with the direct injection system in which temperature in the combustion chamber is decreased because of the vaporization heat, heating preliminarily and ignition at a constant temperature stabilizes the operation of the engine.

The movement speed between the piston and the liner decreases so that the momentum of the piston and the crankshaft at one combustion cycle may decrease to the extent that the cylinder liner is shortened. The number of revolutions of driving of the engine is improved to the count of twist twice or more now. The result response of the engine to the accelerator operation and the change in the output increase, a slight control of the operation becomes possible, and driver's operational feeling improves.

Exhausting the combustion high pressure gas in the liner to the exhaust pipe, amount of the work in the pressure reduction process is decreased in proportion to the number of squared amount of the work of the high-pressure and high-temperature gas generated in the combustion chamber of the

engine. Before losing enough energy, using it as a gas for the drive of the turbo-charger for the air compression of the second step improves the dynamic thermal efficiency of the entire system of the engine

The turbo-charger compresses air by the compression process of two steps or more. For that work, the exhaust pipe is shaped as shown in the design drawing No. 4 and fit the turbocharger. The muffler installs the tail pipe of the large-bore so that no pressure may hang to the atmospheric pressure.

One electric drive type supercharger in preparation is put in the compression step for the initial compression or the case of where it could not secure expected set pressure. As a result, the capacity is set to secure the given air pressure at any time.

An intercooler and an electric heater are set to the compression step in order to secure the given temperature in the air receiver. The heater especially has a big influence in the operation when the engine starts; it is designed and installed so that the performance and the characteristic to which capacity and the continuous operation time can pass even in the cold district as being.

The temperature sensor and the pressure sensor are set at the air tank, the temperature stabilization device, the combustion chamber, and the exhaust pipe, etc., and are controlled by the microcomputer. It is operated with the microcomputer for the engine control integrally.
The sensors with highly arrangement and performance is needed to operate the intercooler and the heater precisely and to accept the temperature changes of the liner after the passing the inhalation valve and the fuel vaporization with heat, according to the information exchange with the sensor of the accelerator's progress angle installed in the microcomputer for the engine control.

To keep the amount of work of the turbocharger, petroleum-derived material such as hydrocarbon gas or liquid is poured between the exhaust pipe and the turbocharger.
In addition, as the exhaust gas clarification means, the engine is behaved under the fuel dilution which is below the theoretical air fuel ratio and under the high temperature as same as theoretical value. (Burning or the explosion is operated in the combustion chamber.) Normally inert gas in the exhaust gas such as nitrogen gas etc. is oxidized. When the hydrocarbon gas is infused, peroxidized exhaust gas is reduced by the carbon or the hydrogen.
Then, particulate matter in question which is consist primarily of hydrogen sulfide and generated by the diesel engine can be reduced, and exhaust can be hold down.
Nitric oxide (NOx) is originally chemically active material and is used as the oxidizer of the liquid rocket fuels. When the hydrocarbon gas is injected into the exhaust manifold at the high temperature, it can react at once and be rendered harmless.